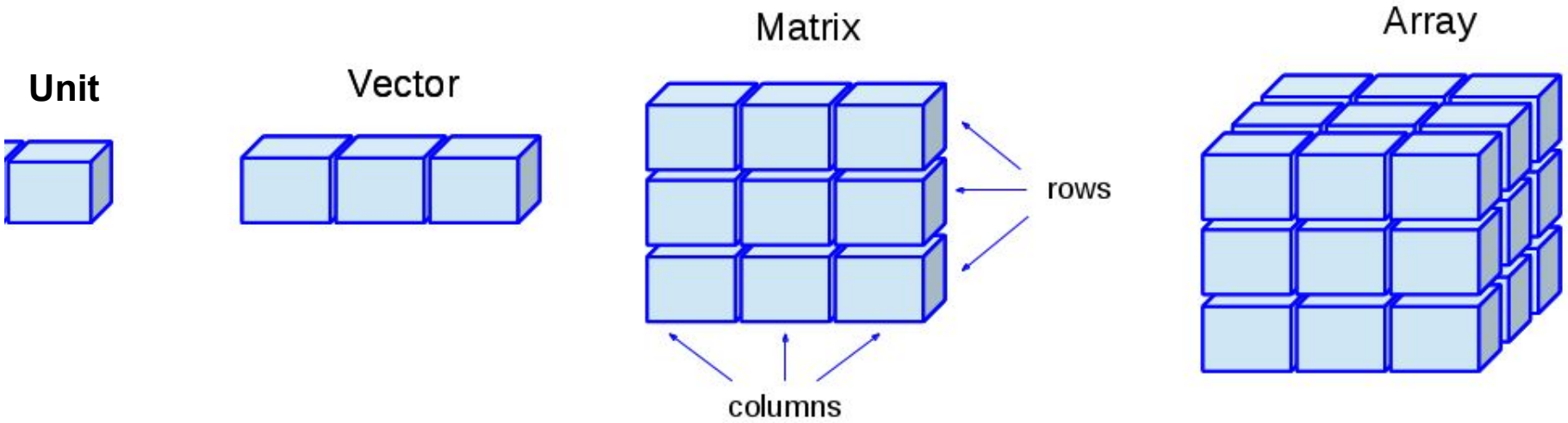
The ***Seurat*** Object*

~~For Dummies~~

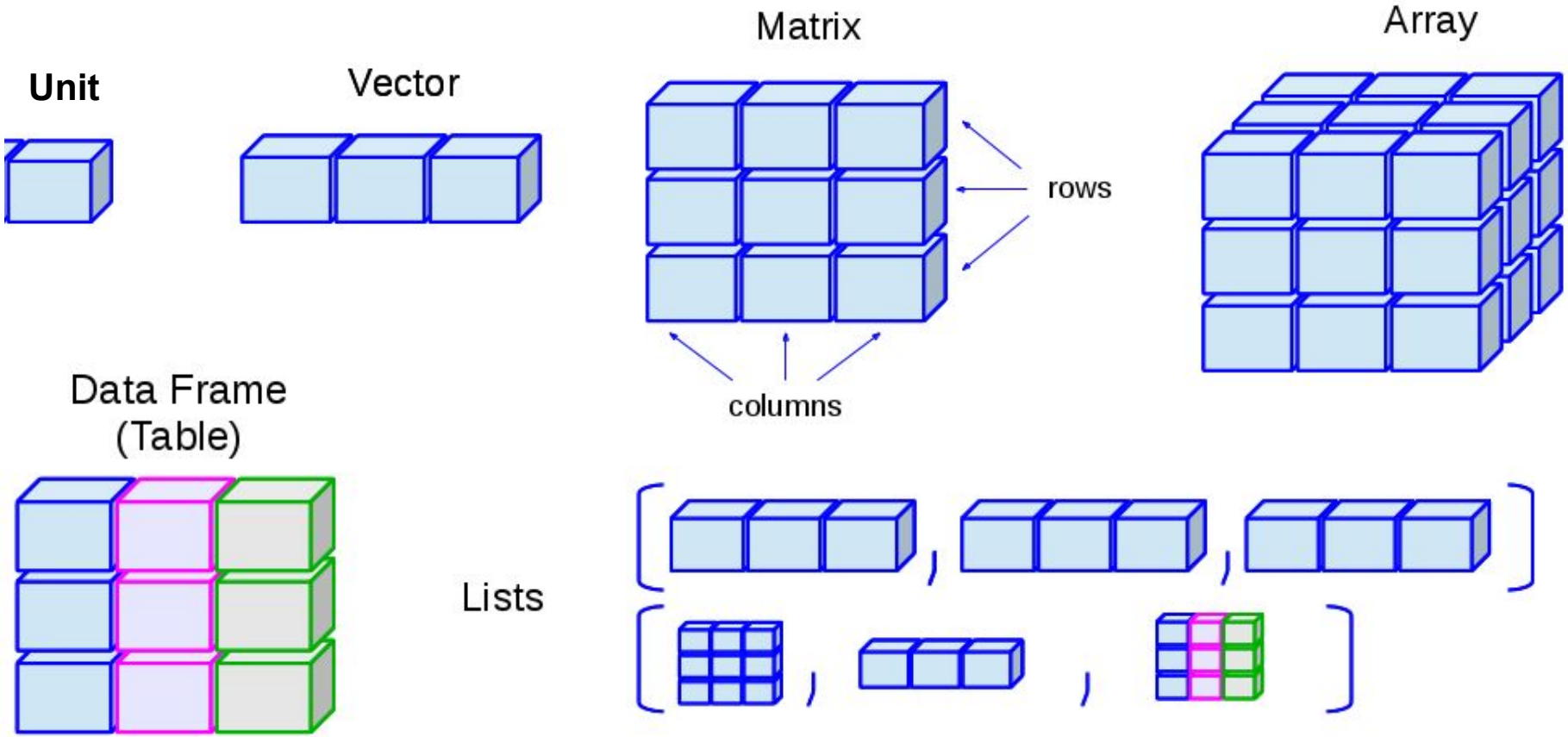
For Biologists

** v4.x*

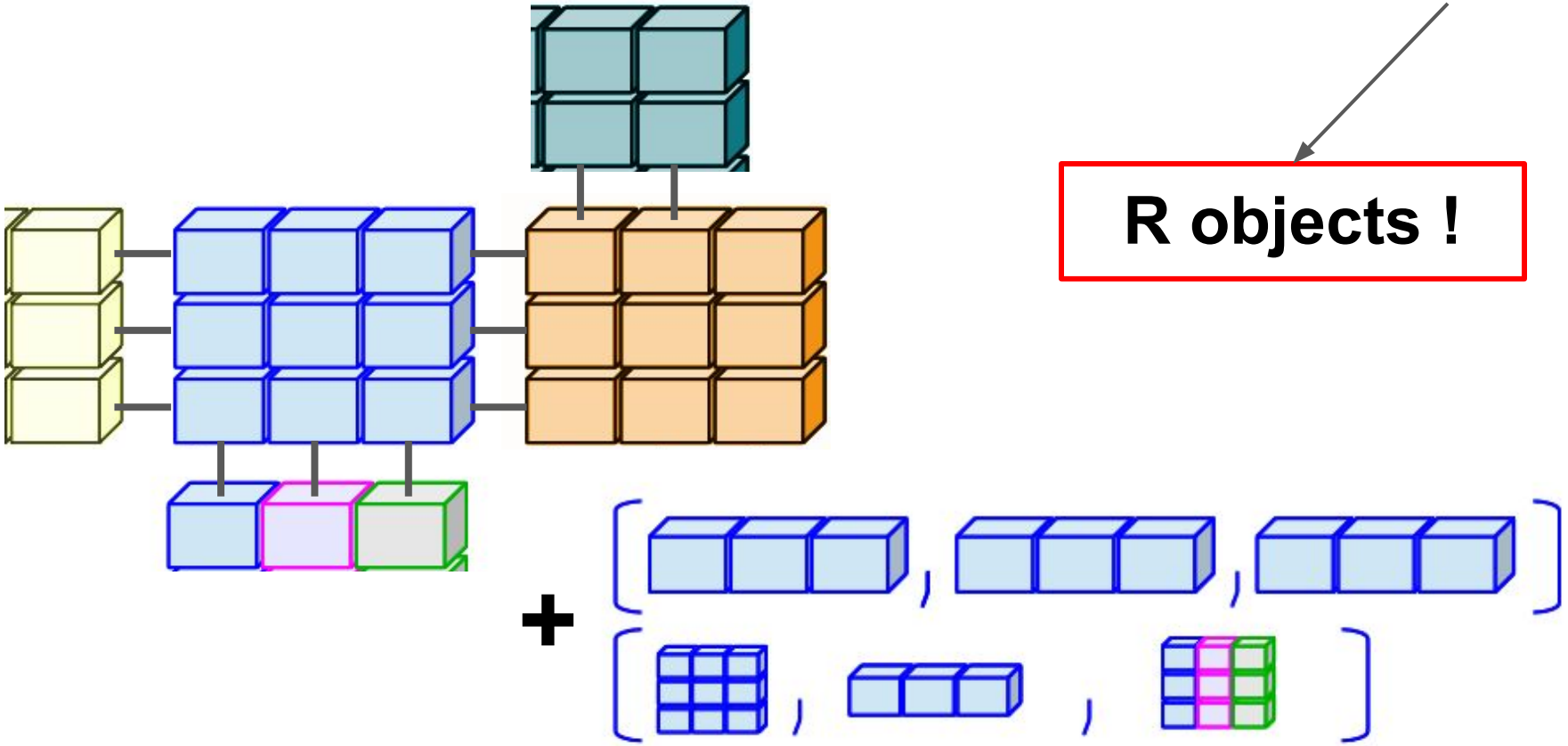
Some basic data types in R



Some more data types in R

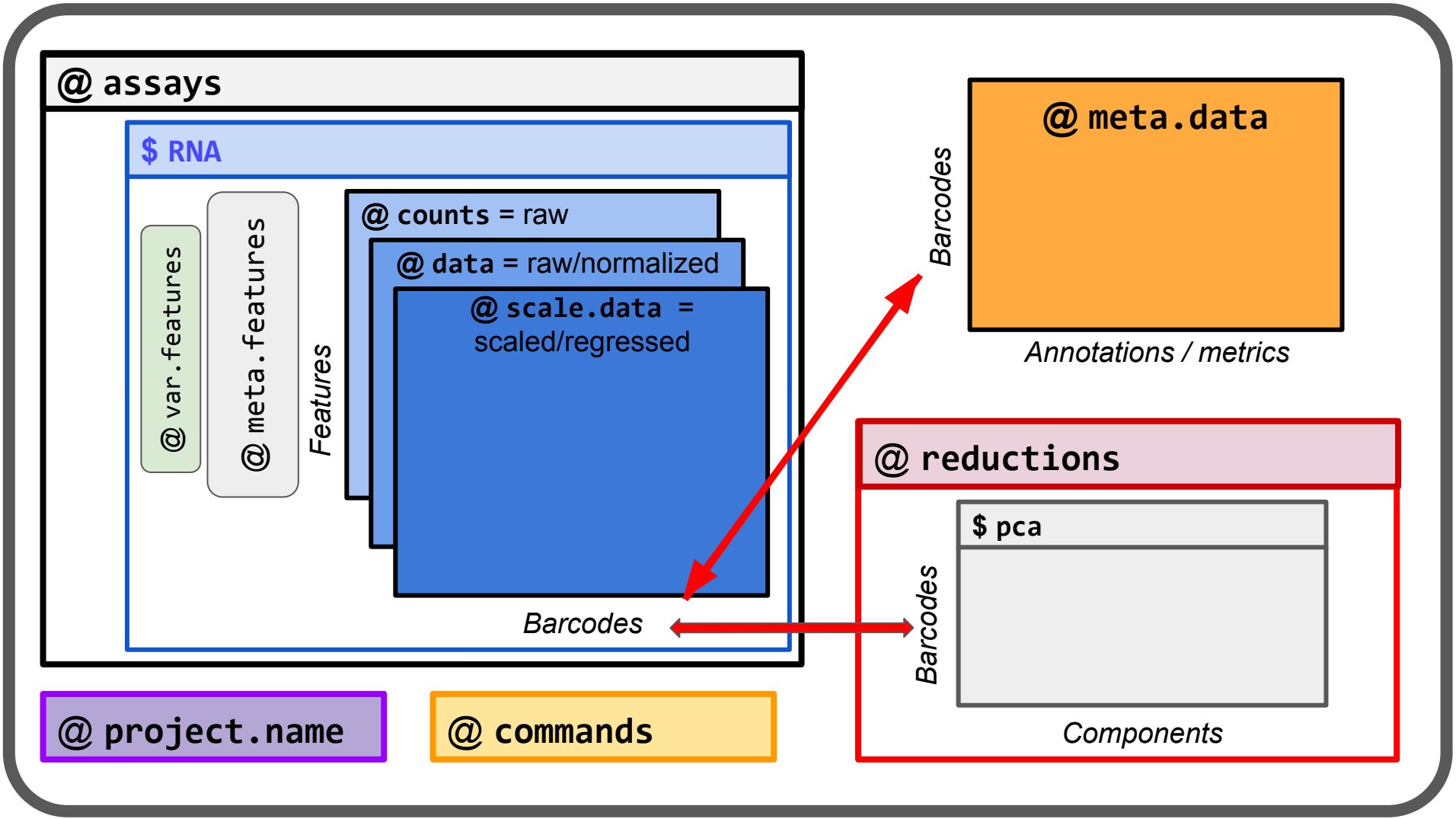


Add complexity ? Have a structure ? Links between data ?

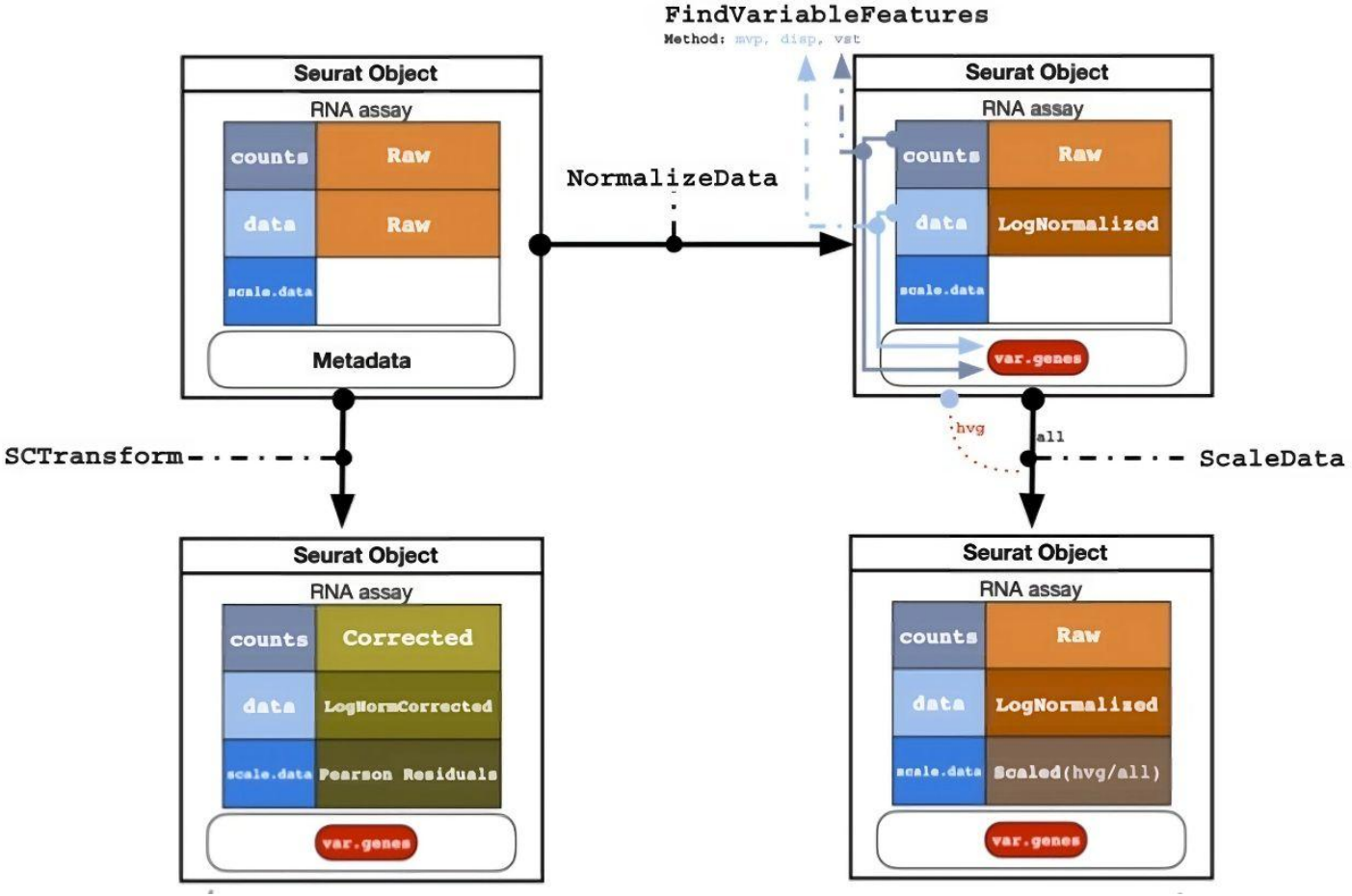


The **Seurat** object is a hierarchical data **container**

- When created from scratch, a Seurat object contains information in **slots** :
  - @ `meta.data` : data frame ; contains metadata **qualifiers** for **barcodes/cells**
  - @ `assays` : a list of containers for count data (assays), the default one named :
    - $ `RNA` : container of :
      - data matrices (feature x barcode) :
        - @ `counts` : contains **raw** counts *(filled by default)*
        - @ `data` : contains **normalized** counts *(filled with **raw counts** by default !)*
        - @ `scale.data` : contains **scaled** counts *(empty by default)*
      - `meta.features` : data.frame ; contains metadata **qualifiers** for **features**
      - `var.features` : vector ; contains the name of a **selection of features** (based on their **high expression variability**)
    - $ `...`
  - @ `reductions` : a list of containers for **dimension reduction** spaces (PCA, etc). By example :
    - $ `pca` (component x barcode)
    - $ `...`
  - @ `project.name` : character that defines the **project name**
  - @ `commands` : a freeze of the different **steps** the object underwent, and their **parameter values**

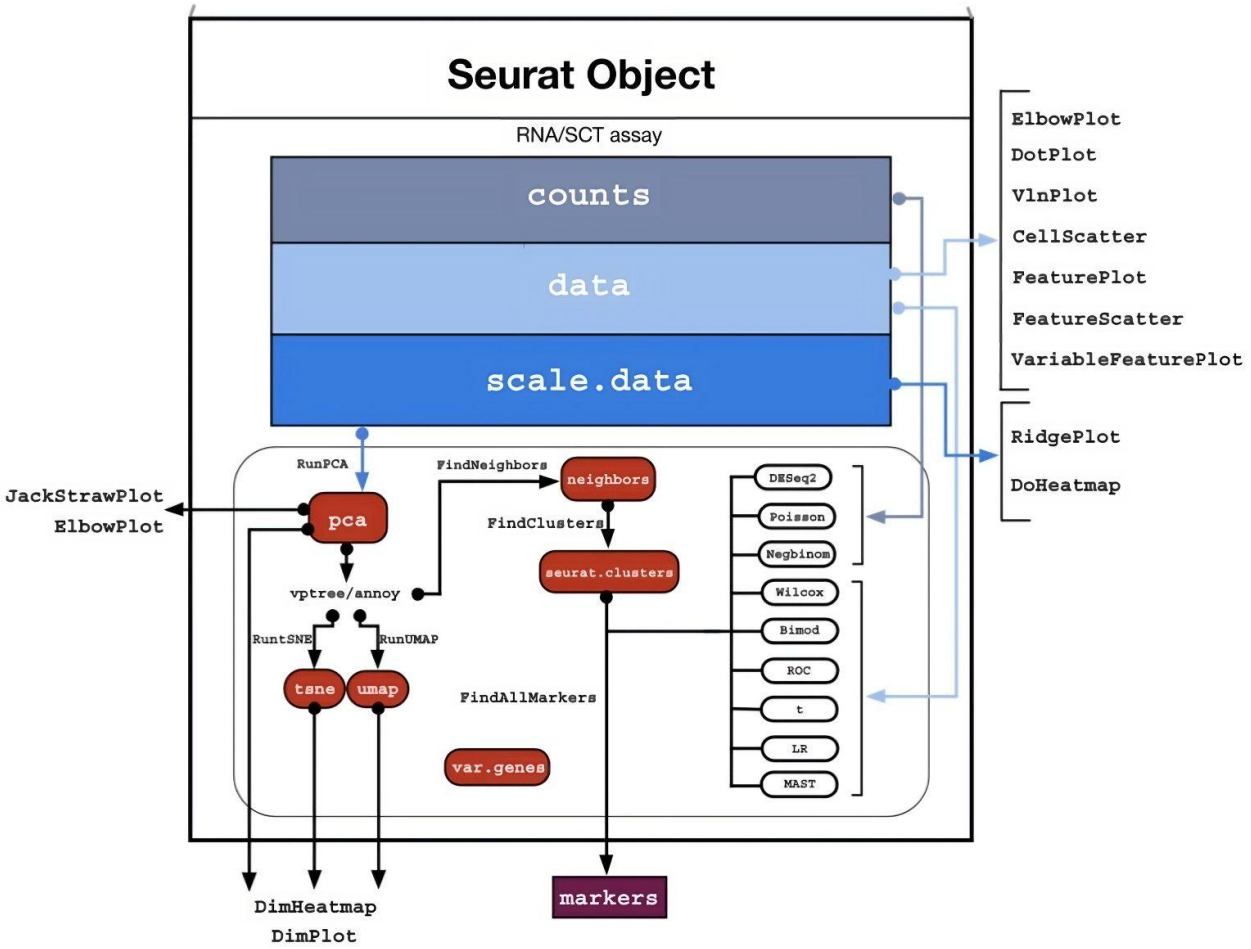

@ assays
$ RNA
@ var.features
@ meta.features
Features
@ counts = raw
@ data = raw/normalized
@ scale.data = scaled/regressed
Barcodes
@ meta.data
Barcodes
Annotations / metrics
@ reductions
$ pca
Barcodes
Components
@ project.name
@ commands

Cheat sheet : **Seurat** object evolution through analysis



Source : X @the HumanBorch

Cheat sheet : Interaction of content with analysis steps



Source : X @the HumanBorch

! WARNING !

- Current (as of 2023/10) Seurat object format is **v4**
- Newest version (**v5**) is expected to be released ***very soon***
  - @ **Seurat** package (contains functions) v5 submitted to CRAN (not released yet)
  - @ **SeuratObject** package (contains the Seurat object specifications) is already available :
    - $ https://cran.r-project.org/web/packages/SeuratObject/index.html
- This new object version will have multiple modifications to its structure
  - @ Introduction of ***layers***
- Consequently, some of the explanations given in this presentation may soon be **obsolete**, at least *partially*
- However, the v5 object structure should be ***compatible*** with v4.